Overexpression of *BplERD15* Enhances Drought Tolerance in *Betula platyphylla* Suk

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In this study, we report the cloning and functional characterization of an early responsive gene, *BplERD15*, from *Betula platyphylla* Suk to dehydration. *BplERD15* is located in the same branch as *Morus indica* Linnaeus *ERD15* and *Arabidopsis* Heynh *ERD15* in the phylogenetic tree built with ERD family protein sequences. The tissue-specifific expression patterns of *BplERD15* were characterized using qRT-PCR and the results showed that the transcript levels of *BplERD15* in six tissues were ranked from the highest to the lowest levels as the following: mature leaves (ML) > young leaves (YL) > roots (R) > buds (B) > young stems (YS) > mature stems (MS). Multiple drought experiments were simulated by adding various osmotica including polyethylene glycol, mannitol, and NaCl to the growth media to decrease their water potentials, and the results showed that the expression of *BplERD15* could be induced to 12, 9, and 10 folds, respectively, within a 48 h period. However, the expression level of *BplERD15* was inhibited by the plant hormone abscisic acid in the early response and then restored to the level of control. The *BplERD15* overexpression (OE) transgenic birch lines were developed and they did not exhibit any phenotypic anomalies and growth defificiency under normal condition. Under drought condition, *BplERD15-OE1*, *3*, and *4* all displayed some drought tolerant characteristics and survived from the drought while the wild type (WT) plants withered and then died. Analysis showed that all *BplERD15-OE* lines had signifificant lower electrolyte leakage levels as compared to WT. Our study suggests that *BplERD15* is a drought-responsive gene that can reduce mortality under stress condition.